Environmental Protection Agency

Diurnal Evaporative Emission (Heat Build) Test Procedure

This procedure is written for the Environmental Protection Agency, National Vehicle and Fuel Emissions Laboratory (NVFEL) internal use. The use of specific brand names by NVFEL in this procedure are for reference only and are not an endorsement of those products. This document may be used for guidance by other laboratories.

NVFEL Reference Number

705E

Implementation Approval

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Revision Description

(1) 09-30-94 The purpose of this change is to revise the procedure as described in EPCN #170.

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1. Purpose

The purpose of this procedure is to quantify evaporative emission losses occurring during a simulated 1-hour diurnal temperature rise.

These measurements are added to hydrocarbon emission losses from the required Hot Soak Evaporative Emission Test (TP 709) to obtain a measurement of total hydrocarbon vapor losses occurring during motor vehicle operation.

2. Test Article Description

Test vehicles that require evaporative emission testing

3. References

3.1 "Code of Federal Regulations": Title 40, Part 86, Subpart B; Sections 86.105, 86.106, 86.107, 86.113, 86.114, 86.116, 86.117, 86.121, 86.127, 86.130, 86.133, and 86.143

3.2 Environmental Protection Agency (EPA) Laboratory Safety Manual

3.3 LFE temperature achiever operational procedure

3.4 TP 702, Vehicle Fuel Exchange

3.5 Memo, M. Reineman, March 1, 1989, Subject: "Ethylene Glycol Spills During Evap Testing"

4. Required Equipment

4.1 An Evaporative Emission Test Guideline (see Attachment A) is posted on each Sealed Housing for Evaporative Determination (SHED).

Form 705-01, Evaporative Emission Test, (Attachment B)

Form 702-01, Vehicle Fuel Exchange, (see TP 702)

(1) Form 902-01, Test Status Report

Vehicle Specification Report

4.2 SHED enclosure with:

Purge fan capable of reducing hydrocarbon concentration from test level to ambient level between tests.

Cooling package and mixing blower with 200 cfm to 1,000 cfm max.

Equipment used: AESi Model 7500 SHED

4.3 Hydrocarbon (HC) Analyzer Recorder:

Evaporative emission hydrocarbon data recording system, strip chart potentiometric recorder, on-line computer system, or other suitable means.

The system used must have operational characteristics (signal-to-noise ratio, speed of response, etc.) equivalent to or better than those of the signal source being recorded, and must provide a permanent record of results.

Temperature recording system:

Strip chart recorder or automatic data processor.

The system used must be capable of recording each temperature at least once every minute, resolving the time to ±15s and resolving the temperature to ±0.75 °F.

The recorder shall have a time accuracy of ±15s and a precision of ±15s.

The temperature recording system (recorder and sensor) shall have an accuracy of ±3 °F.

Equipment used: Soltec strip chart recorder, Model 3316, to record hydrocarbon emission and SHED temperatures

4.4 Temperature sensors, thermocouples:

Type “J” thermocouples, iron-constantan; 2 channels available for vehicle fuel tanks, 1 primary and 1 auxiliary fuel tank thermocouple.

Two thermocouples fixed for monitoring SHED ambient air, 1 fixed for monitoring SHED inlet cooling water temperature and 1 fixed for monitoring SHED outlet cooling water temperature.

Equipment used: Variety of thermocouples

4.5 Hydrocarbon emission analyzer system -- Flame Ionization Detector (FID)

Equipment used: Beckman Model 400 hydrocarbon analyzer

4.6 Automatic temperature achiever:

Capable of controlling fuel tank temperature to within ±3 °F

Equipment used: Leeds & Northrup Electromax III System or LFE Corporation temperature achiever

4.7 Heat blanket(s) -- must not cause hot spots on the tank wetted surface

Equipment used: Various size silicone rubber heat blankets supplied by William C. Fay Company, Orchard Lake, Michigan; and Conrad Company, Inc., Royal Oak, Michigan

4.8 Magnets or other related equipment for attaching the heat blanket to the vehicle fuel tank

4.9 Barometer

Centrally located and must agree within ±0.03 inch of mercury of the corrected mercury column.

Equipment used: Mensor digital barometer

4.10 Digital clock set to the master time clock and located at each site

Equipment used: Fabricated to meet our requirements

4.11 Event timer for marking the time on strip chart traces for all recordings

Equipment used: Fabricated by the Electronic Support Group to meet our requirements

4.12 Combustible gas detector:

Capable of detecting combustible vapors, opening the SHED enclosure door, and sounding the alarm

Equipment used: GasTech Model 1220

5. Precautions

5.1 Vehicle fueling safety precautions must be followed, as outlined in Section 5 of TP 702, Vehicle Fuel Exchange.

5.3 Test vehicles must be moved in and out of the SHED enclosure using extreme caution to minimize the possibility of damaging the enclosure and/or the vehicle.

5.4 If at any time the SHED combustible alarm sounds, the SHED door should automatically open and the purge blower should activate.

Perform the operation manually if this automatic feature fails to function.

5.5 When it is not attached to the fuel tank filler neck, the test vehicle's fuel cap must be kept in a place where it will be safe from damage.

5.6 If the SHED must be abandoned suddenly (e.g., fire or tornado warning), turn off the temperature achiever power, if possible, before leaving.

5.7 The operator must use the real-time monitor clock displayed in the soak area for recording the time the event occurred.

5.8 If the strip chart recorder power has been off for any period of time, an equal period of time with the recorder power on is required for instrument warm-up.

A 1-minute power off requires a 1-minute warm-up, etc., up to a 1-hour maximum warm-up.

5.9 Prompt notification of the Vehicle Testing (VT) Supervisor and Calibration and Maintenance (C&M) Manager is required any time the SHED exhaust system monitoring light is observed on continuously.

5.10 The test will be aborted if large vehicle coolant leaks are observed in the SHED.

5.11 If severe HC hang-up is encountered, inspect the vehicle for possible cause and notify the C&M Manager.

6. Visual Inspection

Before each test, ensure that any exhaust piping is sealed and inspect the SHED for obvious leaks, holes, and other damage (e.g., escape hatch or ceiling Tedlar) and possible obvious hydrocarbon sources (e.g., spilled vehicle fluids, paint cans, etc.).

7. Test Article Preparation

The SHED operator is responsible for assuring that the following preparatory steps are performed prior to the diurnal heat build test:

7.1 The vehicle must be allowed to soak for a minimum of 10 hours but not more than 36 hours.

Note: The heat build should start long enough before the 34th hour to allow for vehicle hookup on the dynamometer.

7.2 Check the calibration gas cylinders.

If bottle pressures are less than 100 psi, notify the C&M Manager.

7.3 (Perform daily) Check that the FID analyzer is operational and that the FID fuel and air pressures are correct (posted inside the FID).

The FID flame is routinely left burning continuously to ensure analyzer stability. The burner must be lit at least 30 minutes prior to calibration. Notify the C&M Manager if problems with the FID are suspected or occur.

7.4 Check the SHED exhaust system monitoring light above the strip chart recorder.

If the light is observed on continuously, notify the VT Supervisor and C&M Manager.

Do not start the diurnal test until directed by the VT Supervisor.

Check that the strip chart recorders used for monitoring SHED temperatures are working properly and the power has been on for at least 1 hour and that the temperature achiever power has been on for at least 15 minutes.

7.5 Check the SHED ambient temperature to assure that it is within the required range of 68-86 °F.

7.6 On the heat build strip chart, record the following:

Date, SHED Identification Number (SOO #), Analyzer Site Number (AO #), Test Number, Vehicle ID #, Strip Chart Recorder Equipment Tracking Identification Number (ET #), Temperature Achiever Number (LFE #), Chart Speed, and the Technician's ID #.

Verify that each channel used has the correct pen color as listed on the SHED.

7.7 If the FID analyzer has not yet been used during the testing day, calibrate the working range (see Step 103), making sure that the calibration gas flow rates are adjusted to 4.0 standard cubic feet per hour (scfh).

7.8 On Form 705-01, record the:

MFG Code, Vehicle ID, FTP Test Type, Test Date, FTP Test #, and the Heat Blanket #, and the Technician's ID#.

For both the diurnal and the hot-soak, record the SHED # and the Analyzer Number (should be the same numbers unless another SHED is used to complete the hot-soak.)

Other data are recorded on Form 705-01 as the test proceeds.

8. Test Procedure

The SHED operator is responsible for assuring that the following steps are performed during the diurnal heat build test. A guideline with the required steps for this procedure is posted on each SHED for reference.

The draining and fueling of the vehicle prior to the heat build test are described in TP 702.

101 Open the SHED door and turn on the SHED purge blower.

The purge blower must remain on until the temperature of the fuel in the vehicle tank reaches 58 °F or until the SHED doors are closed and sealed at which time the purge blower will shut off.

102 Turn the SHED mixing fan on if it is not already operating.

Set the SHED cooling package switch to the “heat build” position.

103 Calibrate the FID analyzer.

Select the lowest available HC sampling range on the FID instrument multiplier.

Start the Soltec 5-pen strip chart recorder; set the chart speed to 2 cm/minute; begin recording the SHED ambient temperature and hydrocarbon concentrations for zero, span, and sample.

The calibration readings must be stable.

A stable trace is a minimum 30-second segment in which the maximum and minimum points differ by no more than 1% of full scale.

The numerical value of the reading is the end point of the operator's visual linear fit of the trace.

This reading must be within 0.4% of full scale of the posted span point. In some unusual circumstances, the span reading may not be within 0.4% of full scale from the posted set point.

If the FID is spanned incorrectly and the difference between the actual set point and the required set point does not exceed 5% of full scale, a calculation may be performed to correct for the calibration offset.

Notify your team leader in such cases.

Zero: Select the zero gas.

Adjust the flow rate to 4.0 scfh if necessary. Adjust the instrument zero potentiometer until an accurate zero reading is obtained.

Span: Select the span gas.

Adjust the flow rate to 4.0 scfh if necessary. Adjust the instrument gain potentiometer until an accurate span reading is obtained.

Zero: Select the zero gas and check the zero.

If the zero and span readings are accurate within the tolerance (±0.4%), the calibration is complete.

If the zero has shifted out of tolerance, adjust it to zero.

The analyzer must then be spanned and the zero checked again until there is no out-of-tolerance shift in the zero calibration or span calibrations.

Note: If a stable reading cannot be obtained, the instrument should be repaired or replaced. Adjustment of the analyzer flow rate should not be necessary if the regulator is working correctly. Make the required flow rate adjustments and continue testing.

Notify the C&M Manager as soon as possible if either condition exists.

104 Set the analyzer to the sample position, turn the sample pump on, and adjust the flow rate to 4.0 scfh if necessary.

On the strip chart, identify all calibration areas, the range used and calibration set points.

Label the strip chart with the following standard markings to indicate :

initial zero set points - the number “zero”

initial span set points - the word “span”

verified zero set points - the number “zero” with a check mark “3”

verified span points - the word “span” with a check mark “3”

a range change - write “R/C HC 14-16”

the initial HC reading - the letters “BG”

the final HC reading - the word “sample”

105 Verify that all windows and vents which can be opened are opened and that the luggage compartment and trunk and/or hatchback are open.

For vehicles in which an enclosure would be left sealed (e.g., convertible or removable tops), that enclosure need not be open.

On vans and pickup trucks with caps, rear doors and any windows in the caps or van rear area must also be opened.

If windows are power-driven and they have not been lowered, notify the team leader.

On Form 705-01, record completion of this step.

106 Install the heat blanket(s) on the vehicle tank, if necessary, and connect the thermocouple lead(s) to the vehicle fuel tank(s) thermocouple(s).

If the vehicle has an auxiliary tank, clearly identify which lead is connected to which tank thermocouple on the strip chart.

Verify the operation of the heat blanket by briefly activating the temperature achiever and feeling the heat blanket for warmth.

Refer to the LFE temperature operational procedure for specific details.

107 Check the temperature of the fuel in the tank.

If it is below 58 °F, activate the temperature achiever and raise the fuel temperature to 58 °F.

Do not overheat the tank; the temperature rise should be approximately 1 °F per minute.

108 As soon as the temperature of the fuel in the vehicle tank reaches 58 °F, correctly cap the fuel tank, close the SHED door, and inflate the door seal.

The SHED mixing fan must be operating at this time.

Mark the strip chart trace “gas cap on” and “SHED door sealed” at that point.

For vehicles with multiple fuel tanks, both tanks' fuel temperatures must be between 58-62 °F simultaneously before the fuel caps are installed.

The auxiliary tank's fuel temperature must remain within ±3 °F of the primary tank's fuel temperature at all times during the heat build.

Ideally, fuel temperatures should be the same at the start of the test.

The formula in Step 113 applies to the main tank.

109 As soon as the temperature of the fuel in the tank reaches 60 °F and the secondary fuel temperature is between 58 °F and 62 °F, time t = 0, place the achiever in auto mode and begin the heat build.

Although a tolerance of ±2 °F is allowed for the starting temperature, it is desirable to begin the heat build at exactly 60 °F fuel temperature.

When the fuel tank(s) has(have) been capped and sealed, the SHED door has been sealed, and the fuel temperature is at 60 °F ±2 °F, immediately start the event timer.

This will mark all pen traces automatically and will continue to mark them at 5-minute intervals.

Readings should be taken at these marks unless otherwise noted on the trace.

On the strip chart, label the start time t = 0 point as indicated by the event marker.

At the t = 0 point, take the Diurnal Initial HC sample reading.

If the reading is not stable (according to the definition in Step 103), the operator should average the last 30 seconds of HC trace.

The average of the readings should be used as the initial HC sample.

110 Verify the analyzer calibration.

Turn off the sample pump; select the analyzer span mode.

Span Check: Select the span gas and span check the FID.

Do not adjust the gain setting, allow the reading to stabilize, and check that the reading is within tolerance limits.

Zero Check: Select the zero gas and zero check the FID.

Do not adjust the gain setting, allow the reading to stabilize, and check that the reading is within tolerance limits.

If the calibration points do not return to within 2.0% of full scale of the posted set points, or if a stable reading cannot be obtained, repeat the check.

Notify your team leader if any checks are not within the tolerance limits allowed.

If the calibration checks are within tolerance, place the analyzer in the sample mode, turn on the sample pump, leave the chart drive on 2 cm/min, and record continuous HC sample and temperature traces.

111 On the strip chart, identify all calibration points, the range used, deflections read, and calibration checks.

On Form 705-01, record the following Diurnal Initial readings: AMB. TEMP, BARO "HG, HC RNG, and the HC SAMPLE (from the strip chart at the t = 0 point).

Also under the Evap Test header, record the Diurnal Start Time from the real-time monitor clock displayed in the soak area.

112 If the HC sample reading goes above the posted span point, and the FID calibration verification has been completed, turn off the sample pump, calibrate the next highest range (see Step 103), and return to the sample position.

Turn on the sample pump and continue to record the HC sample reading.

113 The fuel shall be heated in such a way that its temperature change conforms to the following function to within ±3 °F (±1.6 °C)

$F = T_o + 0.4\ t$ (for SI units $C = T_o + (2/9)t$)

Where:
- F = fuel temperature, in °F
- C = fuel temperature, in °C
- T_o = initial fuel temperature
- t = elapsed time, in minutes, from the start of the test.

After 60 ±2 minutes of heating, the fuel temperature rise shall be 24 ±1 °F (13.4 °C (±0.5 °C)). [See CFR 86.133]

Note: For vehicles with multiple tanks, the auxiliary tank shall undergo a similar heat build such that the fuel temperature shall be within 3 °F of the primary tank.

114 Use the equation $F = T_o + (0.4 \times t)$ to calculate the target fuel temperatures at t = 15, 30, 45, and 60 minutes.

On Form 705-01, record the target temperature values.

115 At 15-minute intervals during the heat build (t = 0, 15, 30, 45, and end of diurnal), verify that the temperature(s) of the fuel in the tank(s) and the SHED ambient temperature are within the target temperature tolerances.

116 At approximately t = 45, turn off the sample pump, determine the proper FID range to use, and calibrate that range.

The range should be selected such that the sample reading is between 20 deflections and the posted span point.

If the sample reading is above the posted span point, calibrate the next highest available range and use that range for the HC sample reading.

Identify all FID calibration areas on the strip chart.

Place the analyzer back in the Sample mode, start the sample pump, and let it run until the end of the test (t = 60).

Note: If the reading is above the span point on R-16, use R-19 even if the reading is below 20% of full scale.

117 When the temperature of the fuel within the primary tank has risen 24 °F ±1 °F to a final temperature and the time constraint of t = 60 minutes ±2 minutes is met, the heat build is complete.

Although a tolerance of ±2 minutes is allowable, it is desirable to end the heat build at 60 minutes if possible.

Immediately upon completion of the heat build, turn off the fuel tank heat source.

118 At t = 60, the event marker will mark the HC sample trace and the SHED ambient air temperature trace on the strip chart.

If the end of the heat build is other than 60 minutes, the traces must be marked and a time entered on the strip chart, from the real-time monitor clock displayed in the soak area, corresponding to that end time.

119 On Form 705-01, record the following Diurnal Initial readings: AMB. TEMP, BARO "HG, HC RNG, and the HC SAMPLE (from the strip chart at the t = 60 point or as described in Step 118).

Also record the Diurnal End Time from the real-time monitor clock displayed in the soak area (or the time as described in Step 118).

120 Verify the FID calibration (see Step 110) and identify all calibration check readings on the strip chart.

When verification is completed, turn off the strip chart drive.

121 Deflate the SHED door seal and open the SHED enclosure.

Remove the heat blanket from the vehicle.

122 On Form 705-01, record the total diurnal elapsed time.

123 Disconnect any remaining equipment used specifically for this part of the test.

The test vehicle is now ready to be pushed onto the dynamometer for the exhaust emission test, which must start within 1 hour from t = 60, or at the end of the heat build.

9. Data Input

9.1 On Form 705-01, record the MFG Code, Vehicle ID, FTP Test Type, Test Date, Diurnal Start Time (standard 24-hour clock time), Elapsed Times, FTP Test #, Diurnal End Time, Heat Blanket #, and the Technician's ID#.

Verify the following diurnal and hot-soak initial and final data have been recorded: SHED #, Analyzer Number , AMB. TEMP, BARO "HG, HC RNG, and the HC Sample.

9.2 On the heat build strip chart, record the following: Date, SHED Identification Number (SOO #), Analyzer Site Number (AO #), Test Number, Vehicle ID #, Strip Chart Recorder Equipment Tracking Identification Number (ET #), Temperature Achiever Number (LFE #), Chart Speed, and the Technician's ID #.

9.3 On the strip chart, identify all calibrations, initial HC sample readings, final HC sample readings, calibration checks, fuel tank temperatures, SHED ambient temperatures, and SHED water temperatures.

10. Data Analysis

Forms pertaining to the evaporative emission test remain at the SHED until the completion of Test Procedure 709.

10.1 All forms and test records are verified by a qualified technician who did not record the data.

The verifying technician checks the data for completeness, accuracy, and compliance with EPA regulations. He/she will write his/her identification number and date in the “Verified By” area of the forms.

On the strip charts, the technician will write his/her identification number and “OK.”

This certifies that the data are accurate and complete.

10.2 Form 705-01, along with all other documentation accumulated during testing, is submitted to Data Control for processing at the completion of the hot soak test.

10.3 Span and zero points are verified for all analyzer calibrations.

10.4 Each HC sample reading on the analyzer strip chart is verified.

10.5 SHED temperature traces are checked to assure that readings have been correctly identified and tolerances have been adhered to during the diurnal heat build and hot soak tests.

10.6 Form 705-01 is reviewed for adherence to time tolerances.

10.7 Form 705-01 is processed by computer personnel to obtain final evaporative emission results.

11. Data Output

When the SHED report is generated, it is checked against the input data on Form 705-01 and "OFFICIAL VALUES" is stamped on it, thereby indicating completeness and acceptability of test results.

12. Acceptance Criteria

The following criteria must be met for the test to be valid:

12.1 The heat build (Step 114) must start not less than 10 hours nor more than 34 hours (to allow for vehicle hookup on dynamometer) after the end of vehicle preconditioning.

12.2 Ambient and SHED surface temperatures encountered by the test vehicle must remain within 68-86 °F at all times during the test.

12.3 All windows must be opened that can be opened; the luggage compartment, trunk and/or hatchback, van rear doors, and pickup cap doors and windows must be open during the heat build.

12.4 The heat build must begin as soon as the temperature of the fuel within the vehicle fuel tank reaches 60 °F ±2 °F.

12.5 The fuel temperature in the primary and (if applicable) auxiliary tanks must rise a total of 24 °F ±1 °F, over a period of 60 minutes ±2 minutes.

The temperature of the fuel in the primary tank must conform within 3 °F to the equation $F = T_O + (0.4)$.

12.6 At any given time, the fuel temperature in an auxiliary tank must remain within 3 °F of the fuel temperature in the primary tank.

12.7 FID analyzer zero and span points must be set to within 0.4% of full scale of the posted set points (unless the linear algorithm calculation method is used - see the team leader for calculation).

After sampling, FID calibrations are verified and must return to within 2% of full scale of the posted set points.

All calibration readings must be stable according to the definition in Step 103.

12.8 No raw test data values may be rounded unless specifically allowed in the appropriate section of the CFR.

13. Quality Provisions

These provisions are guidelines which ensure test data quality. Noncompliance does not necessarily invalidate tests.

Any deviations are reported to the Testing Supervisor for further action.

13.1 The technician follows the sequence of steps outlined on the Evaporative Emission Test Guideline, posted on each SHED, recording data as needed.

13.2 FID zero, span, and sample gas flow rates are adjusted to 4.0 scfh.

13.3 The FID analyzer flame routinely burns on a 24-hour basis to improve analyzer stability.

If the FID is off, a minimum warm-up time of 30 minutes is required after lighting.

13.4 The analyzer range to be used on the FID analyzer is calibrated prior to sampling, and the calibration is verified immediately after a sample is analyzed to ensure minimal analyzer drift.

13.5 Time-marked strip charts are used to ensure compliance of the 60-minute heat build time constraint.

13.6 When the Leeds & Northrup temperature achiever power has been off for any period of time, an equal period of time with the achiever power on is required for instrument warm-up.

A 1-minute power off requires a 1-minute warm-up, etc., up to a 15-minute maximum warm-up. The LFE Corporation temperature achiever requires a minimum of 3 minutes for warm-up.

13.7 A continuous hydrocarbon sample may be taken to provide a record of emission during the diurnal test.

13.8 The vehicle is to be fueled as soon as possible after it has been drained.

Any delays, such as equipment problems, must be documented.

Reasonable delays to perform related duties are acceptable.

13.9 Just prior to fueling, to prevent problems with fuel over-warming once it enters the ambient temperature test vehicle fuel tank, check that the test fuel temperature is no more than 53 °F.

13.10 The heat build should begin when the fuel temperature reaches 60 °F, if possible. (A tolerance of ±2 °F is allowed.)

13.11 Variations from the procedure are documented on Form 902-01.

13.12 All clock times are taken from the calibrated digital clocks provided on-site.

13.13 When the strip chart recorder power has been off for any period of time, an equal period of time with the recorder power on is required for instrument warm-up.

A 1-minute power off requires a 1-minute warm-up, etc., up to a 1-hour maximum warm-up.

13.14 A SHED exhaust system monitoring light has been added to ensure isolation of the SHED from the exhaust system negative pressure.

13.15 The technician's identification number must appear on all forms and test records, certifying that the data are accurate and complete.

Attachment A

Evaporative Emission Test Guideline

Diurnal

Verify that the chart recorder pens correspond as indicated below:

Blue - HC-FID analyzer	Black - SHED ambient temp
Red - Primary fuel temp	Green - Heat exchanger inlet water
Brown - Secondary fuel temp	Purple - Heat exchanger outlet water

Inspect the SHED for holes, leaks, damage or hydrocarbon sources.

Turn the purge blower and SHED mixing fan to the “On” position.

Set the SHED cooling package switch to the “heat build” position.

Set chart speed at 2 cm/min and reset the event timer to zero.

Calibrate the FID, then put the chart recorder in stand-by mode and place the FID in the sample mode.

On Form 705-01, indicate that the following are open: vehicle vents, trunk, luggage compartment, hatchback, all windows.

Verify that the heat source is operational.

Record Heat Blanket # on Form 705-01.

When the fuel temperature(s) reaches 58 °F, install fuel cap(s); mark chart “gas cap on.” Close and seal the SHED door; mark strip chart “door sealed.”

When the primary fuel temperature reaches 60 °F, start the chart recorder timer or event marker and take the initial HC sample reading.

This is the t = 0 point of the diurnal test.

Record initial HC sample reading and diurnal start time on Form 705-01.

Verify the FID calibration is within limits and calculate the primary tank target temperatures for 15 minute intervals; enter the values in the chart below.

Use the formula, $T = T_o + (0.4 \times t)$ to calculate the values.

Where: T = Target temperature in °F
T_o = Initial fuel temperature in °F
t = Elapsed time, in minutes, from start of test.

Record the target temperatures on Form 705-01

Note: The final temperature of the fuel rise must be 24 ±1 °F within 60 ±2 minutes.

The auxiliary fuel tank temperature must be within 3 °F of the primary tank during the heat build.

At 45 minutes, calibrate the FID and check sample for range selection.

At 60 ±2 minutes, take the final HC sample reading.

Label the end of the heat build on the strip chart if the elapsed time is other than 60 minutes.

Record final HC sample reading and the diurnal end time on Form 705-01.

Verify the FID calibration is within limits, open the SHED door and immediately remove the heat source from the vehicle fuel tank.

Attachment A Continued

Evaporative Emission Test Guideline

Pre-Hot Soak:

Inspect the SHED for holes, leaks, damage, or hydrocarbon sources.

Turn the purge blower on for a minimum of 5 minutes prior to closing the SHED door.

Close the SHED door and turn the SHED Selector switch to the “Pre-cool” position.

During the FTP Hot Soak, set chart speed at 2 cm/min and reset the event timer to zero.

Calibrate the FID; then put the chart recorder in stand-by mode and place the FID in the sample mode.

Hot Soak:

At approximately 5 minutes before start of the FTP “Hot Start,” turn the SHED cooling mode switch to the “Hot Soak” position.

Verify that the inlet and outlet water temperatures are above 68 °F before vehicle enters SHED.

When the SHED door is sealed, start the event timer which will mark the initial HC sample.

Record initial HC sample reading and hot soak start time on Form 705-01.

On Form 705-01, record elapsed time from FTP EOT to engine off and the elapsed time from engine off to SHED sealed.

Verify the FID calibration is within limits and monitor the SHED ambient temperature during the entire hot soak test.

The ambient temperature must not exceed 86 °F.

At approximately 45 minutes after start of hot soak, calibrate the FID and check the sample for range selection.

At 60 ±0.5 minutes the event timer will mark the end of the hot soak.

Record final HC sample reading and the hot soak end time on Form 705-01.

Verify the FID calibration is within limits.

Attachment B